13.

The Behavior of Two Captive Specimens of the Lowland Gorilla, *Gorilla gorilla gorilla* (Savage & Wyman).[1]

B. F. Riess,[2] Sherman Ross,[3] S. B. Lyerly,[4] and H. G. Birch.[5]

Behavior Research Fellows (1948), *New York Zoological Society.*

(Plates I & II; Text-figures 1 & 2).

I. Introduction.

The field of comparative behavior research has long been subject to two methodological factors which have to a certain extent prevented the attainment of its goal, namely the securing of information on behavioral processes of representative species of a wide range of living organisms. The first factor has been the concentration of research workers on those animals which are adaptable to the limited conditions of laboratories. This emphasis on a few selected species has led to the second factor, the acceptance of the conventional laboratory as the prototype of habitat for the species under investigation. Both these methodological limitations have arisen in part from the same set of circumstances, the relative lack of availability of less adaptable organisms and the expense of field studies. The increasing number of investigations under naturalistic field conditions and of studies on rare specimens under favorable conditions has provided additional evidence of the fruitfulness of the extension of both laboratory and field methodology to specimens other than those generally used in comparative behavior laboratories.

It is one of the purposes of this paper to point to a source of data which can facilitate not only the collection of more information on a wider variety of animals but which can also serve as a training facility for field-workers and others. Within the reach of researchers in most large cities there exist collections of living animals in great variety of species and under varied living conditions. The reference is to the zoological parks and exhibition areas. In many of these, natural habitat conditions are approximated and even the differences can be fertile sources of comparative psycho-ecological studies.

In 1937, Carpenter (2) published a study of two young male mountain gorillas, *Gorilla gorilla berengei*, resident at the San Diego Zoo. In this paper he pointed to the opportunities presented by the fourteen specimens of the largest of the great apes which he listed as available in the zoological parks of the world. Gorillas offer a dramatic field for this type of research since they are, with the exception of the orang-utan, the least studied of the anthropoid apes. The present paper seeks to compare Carpenter's data with those obtained in a study of male and female pre-adolescent lowland gorillas, *Gorilla gorilla gorilla*, in the New York Zoological Park (Bronx Zoo). Such comparative data as can be assembled will be helpful to workers who seek a base line for similar investigation elsewhere. That these investigations are possible is demonstrated in Table I which lists the location and over-all biological indices of the specimens now resident in various collections. The number of gorillas in the United States is increasing. In 1937 there were only eight specimens in this country; today there are twenty-four.

Other than Carpenter's study, material on the behavior of the gorilla is found only in a limited number of papers. Yerkes' pioneer work (6) with the pre-adolescent female mountain gorilla, Congo, is known to all students of comparative psychology. Bingham's 1932 observations (1) on gorillas in their native habitat and Valker's similar study in the Gaboons (5) in 1931 are the only other relevant research. The two lowland gorillas in the New York Zoological Park are included in a report of the external genitalia published by Goss (3).

II. Subjects.

The gorillas studied at the Bronx Zoo are Oka, female, and Makoko, male. Since this study was made the Bronx Zoo has acquired a young female mountain gorilla, but no reference to it will be made in this report, except to list it in Table I. Little is known of the early history of Oka and Makoko. Both animals arrived in the Zoo on September 7, 1941, at which time they weighed 20 and 28

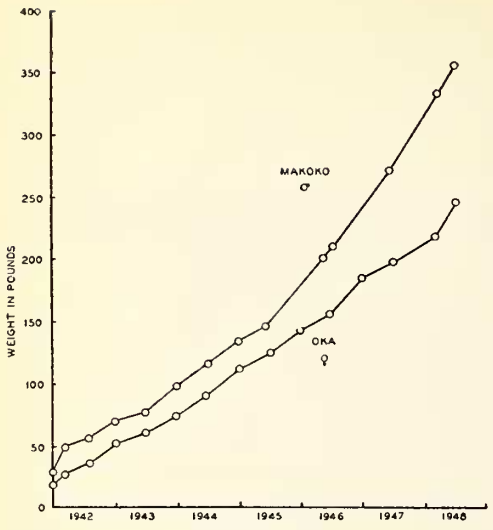
1 The success of this project was due in large part to the co-operation of the staff and keepers of the New York Zoological Park. Particular thanks are due Mr. Fairfield Osborn, Mr. John Tee-Van, Mr. Lee S. Crandall, Dr. L. J. Goss, Keepers Reilley and Quinn, and Mr. Sam Dunton, photographer.

2 Hunter College of the City of New York, N. Y. C.

3 Bucknell University, Lewisburg, Penna.

4 University of North Carolina, Chapel Hill, N. C.

5 City College of New York, N. Y. C.



TEXT-FIG. 1. Rate of growth of Oka and Makoko from time of arrival at the New York Zoological Park on September 7, 1941, until summer of 1948.

pounds respectively. Ages were estimated as one and three years on the basis of weight and bone structure. Text-figure 1 gives the data on the growth of the specimens from the time of arrival until the summer of 1948. The female was weighed, up to June, 1948, while on the keeper's back, the male's weight being merely estimated. In 1948 a Toledo balance was installed, on which the animals were weighed when they voluntarily mounted a platform.

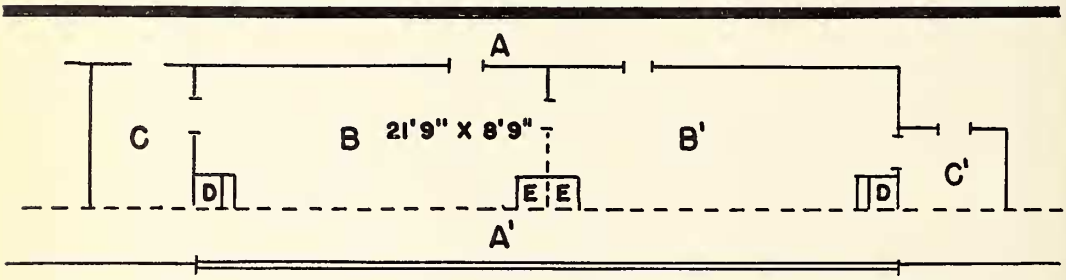
At the present time, Oka and Makoko are magnificent specimens. Makoko has a particularly brilliant coat and a notably prominent supra-orbital ridge. Oka is less impressively marked but is a splendid female example of the species. Both animals are active, healthy and strong. Indeed, Makoko's grip is so powerful that it has been necessary to replace the ¾-inch steel bars of the cage front, which he bent repeatedly. A steel horizontal ladder had to be removed from his cage when he tore it loose from its mooring. Oka is less destructive and retains her ladder.

III. Environmental Conditions.

The gorillas are housed in individual cages separated by a partition consisting of a solid metal access door and a double grill of steel bars. At the ends of each cage are doors leading to shift cages into which the animals are chased when the exhibition compartments are cleaned or repaired. The back wall of the living space is solid masonry with a recessed access door. Between the glass partition through which the public views the animals and the metal barred cage fronts is a passageway for the keepers. The internal features of the living compartments include a platform and a three-step staircase, with the platforms raised two inches from the floor, facing each other in front of the grill between the two cages. The staircases are at the ends near the shift cages. Oka's cage contains a metal horizontal ladder slung between the rear wall and the cage front at a height of three feet. Text-figure 2 shows the floor plan of the gorilla exhibition space.

IV. Daily Schedule of Animal Care.

Although the animals are on exhibition during the hours of 10:00 A.M. to 5:00 P.M. (except on Sundays when the visiting time is extended to 6:30 P.M.), the daily routine is more extensive. The overhead fluorescent lights are turned on at 8:00 A.M. when the keepers enter the building. Between 8:30 and 9:00 in the morning, the gorillas, each of whom has been in its own cage all night, are given their morning meal of skimmed milk and raw eggs. The ingredients are mixed and fed to each gorilla by tilting a can containing the mixture into the subject's mouth as the animal protrudes its lips through the bars of the cage front. Some half-hour to three-quarters of an hour later, the keepers move the gorillas to the shift cages. Separation and enclosure in the individual cages are effected by means of a stream of water. With the gorillas out of the way, the cages undergo thorough cleaning. Shortly before visiting time, the animals are released and are frequently permitted to remain together in one of the two cages for periods up to one hour. This opportunity for association occurs five



TEXT-FIG. 2. Floor plan of gorilla compartments in New York Zoological Park. **A, A'**, passageways for keepers. **B, B'**, exhibition cages for Oka (female) and Makoko (male), respectively. **C, C'**, shift cages. **D**, three-step stairs. **E**, platforms; right-hand platform used for weighing. **Thin line** indicates solid wall; **dotted line** indicates grill-front walls; **double line** indicates glass partition.

TABLE I.

Physical Characteristics of Gorillas in the United States.*

Name.	Location.	Form.	Sex.	Estimated age on September 1, 1949.	Known Weight.	Estimated Weight.
Oka	N. Y. Zool. Park	*gorilla*	F	9 yrs.	282 lbs.	
Makoko	N. Y. Zool. Park	*gorilla*	M	11 yrs.	408 lbs.	
Sumaili	N. Y. Zool. Park	*berengei*	F	20 mos.	20 lbs.	
Joanne	Central Park Zoo, N. Y. C.	*gorilla*	F	10 yrs.		190 lbs.
Carolyn	Central Park Zoo, N. Y. C.	*gorilla*	F	10 yrs.		190 lbs.
Bamboo	Philadelphia Z. G.	*gorilla*	M	23 yrs.		435 lbs.
Massa	Philadelphia Z. G.	*gorilla*	M	18 yrs.		400 lbs.
Bushman	Lincoln Park Zoo, Chicago	*gorilla*	M	21½ yrs.	542 lbs.	
Sinbad	Lincoln Park Zoo, Chicago	*gorilla*	M	20 mos.	38 lbs.	
Rajah	Lincoln Park Zoo, Chicago	*gorilla*	M	29 mos.		47 lbs.
Irvin Young	Lincoln Park Zoo, Chicago	*gorilla*	M	33 mos.	52 lbs.	
Lotus	Lincoln Park Zoo, Chicago	*gorilla*	F	43 mos.		75 lbs.
Miss Congo†	Chicago Z. P.	*gorilla*	F	16 yrs.		325 lbs.
Phil	St. Louis Z. P.	*gorilla*	M	10 yrs.		320 lbs.
Bobo	St. Louis Z. P.	*gorilla*	M	2 yrs.		44 lbs.
Big Boy	Cincinnati Zoo	*gorilla*	M	3 yrs.	35¼ lbs.	
Albert	San Diego Zoo	*gorilla*	M	6 mos.	9¾ lbs.	
Bouba	San Diego Zoo	*gorilla*	F	10 mos.	12½ lbs.	
Bata	San Diego Zoo	*gorilla*	F	8 mos.	10¾ lbs.	
Phil	Colorado Springs, Col.	*gorilla*	M	4 yrs.		40 lbs.
Gargantua	Ringling Bros. Circus	*gorilla*	M	17 yrs.	550 lbs‡	
Mtoto	Ringling Bros. Circus	*gorilla*	F	16 yrs.	438 lbs.‡	

* On October 31, 1949, three young specimens of *Gorilla g. gorilla* arrived in New York. They were a male and a female weighing 12-14 pounds, and a female weighing about 40 pounds. At the time this paper went to press they were still in the hands of Henry Trefflich, an animal dealer.
† Died Sept. 22, 1949.
‡ 1947 weight.

or six times a week and is the only occasion on which the animals are in unrestricted contact with each other. From the time of separation until the main feeding of the day at approximately 2:30 P.M., the gorillas are unattended except insofar as the keepers play with them while passing in front of the cages. The typical afternoon meal consists of carrots, celery, oranges, apples, grapes, bananas, beets, beans, sweet-potatoes, cabbage, onions, cherries and other seasonable fruits and vegetables. All food is fed raw and supplied through the front bars of the cages. Water, *ad lib.*, is available to each animal from a continuously running spigot which empties into a trough running along the back wall of each cage. At 5:30 P.M. the lights are turned out and the gorillas remain unattended until the next morning.

V. Observational Procedures.

Preliminary study of the gorillas was started at the beginning of May, 1948. One of the writers (B.F.R.) visited the Primate House at the Zoo on two days of each week and observed the gorillas for one hour. The times selected were in the early morning when the keepers placed the two gorillas in one cage, and in the late afternoon, at about 3:30 P.M. following the afternoon meal. At the later time, the animals were in separate cages.

As a result of the work during May and early June, a list was evolved on which both quantitative and qualitative indices of behavior could be noted. The inventory consisted of 42 items divided into five categories: posture and locomotion; eating, drinking and elimination; self-oriented activity (play?); inter-individual behavior; and observer-oriented behavior. The sheets of the check list were divided into 10 columns, each of which was used for a three-minute period of observation during the total 30 minute duration of the observational session. Thus it was possible to arrive at the total amount of each of the 42 types of behavior during the 30-minute period and also to determine the sequence of behavior during the period. Additional space was provided for running comments on the activity of the gorillas and for additional notes.

The observers worked in pairs and rotated the pairing so that a measure of control over reliability of observation was possible. There was joint discussion of the meaning of each term on the check-list so that the observers would agree on how to label the activity observed. The problem of the animal's reaction to the observer was considered and it was decided to standardize the position of the observers. Since the gorillas are a very popular exhibit and attract large crowds of spectators, the public exhibition space was used as the location for the observers who sat in pairs in front of the glass partition opposite

the communicating grill between the two cages.

Because the activity of the gorillas varied considerably with the time of day, the number of visitors, the daily routine and other variables, it was decided to distribute the 30-minute observation periods over the whole working day of the animal. However, since the gorillas were allowed to be in the same cage with one another only in the early morning, there was a greater concentration of sessions between 9:00 and 10:00 A.M. The total number of observations made during these hours was 10 one-half hour periods. Sixty-eight sessions were devoted to taking notes on behavior of the animals in isolation. During these 68 periods, it was possible to get data on both Oka and Makoko so that each animal was studied an equal number of times. Every hour between 10:00 A.M. and 6:00 P.M. was covered. In addition to these systematic observations which started in July and lasted through the middle of August, 1948, each experimenter observed the gorillas several hundred times while passing through the Primate House to and from other areas in the Park. Any deviant behavior or peculiar activities were noted and added to the record.

VI. Results and Discussion.

Two factors limit the analysis of the data. In the first place, quantitative analysis affords very little insight into the problem at hand. The purpose of this study was to obtain information which would serve as a starting point for further investigation of the gorillas at the Bronx Zoo, particularly as they become physiologically more mature and show active sex and social behavior. In the second place, it was thought desirable to point to both the similarities and differences between our gorillas and those at the San Diego Zoo described by Carpenter.

In this comparison, there are many difficulties and dangers arising from two sources. In the first place, the gorillas belong to different sub-groups, ours being lowland and Carpenter's mountain specimens. Other variables in this category include age and sex differences between the two sets of observed gorillas. In the second place, it is necessary to stress the differences in the environmental setting in which the San Diego and Bronx gorillas carried out their daily activity. At San Diego, the two male gorillas were housed in outside cages equipped with tree trunks for climbing and various devices which could be manipulated by the animals, for instance logs, swings, ropes, tires, etc. In addition, the experimenter could insert objects into the gorillas' surroundings and study the effect of such introductions. At the Bronx Zoo, the separation of the gorillas from the public was much more rigorous and the cages much more bare. In interpreting the comparative findings, the obvious individual and environmental differences must be kept in mind. However, despite these limitations, the comparison of the two groups should be of value, if only to emphasize the danger of generalizing from any set of observations.

With the restrictions specified above, the data in Table II represent the basic observations made upon the two gorillas at the Bronx Zoo. Where information comparable to that obtained by us was derivable from Carpenter's San Diego observations, it has been included in the Table. The discussion of the data in Table II will follow the general categories outlined above.

A. Posture and Locomotion.

Posture and general locomotion seem fairly well established as invariant gorilla patterns. Both Carpenter's mountain and our lowland gorillas exhibited the same type and frequency of gross motor activity. Walking, running, standing and sitting were characteristically alike for Oka, Makoko and the San Diego pair. Differences were noted in the frequency of observed sleep and in swinging by the hands. Both of these differences may be the resultant of variable environmental and observational procedures. It was not feasible for us to observe night behavior, and swinging was made difficult for Oka and Makoko by the absence of a place suitable for that kind of activity. The complete absence of nest-building in the Bronx pair is also related to the lack of adequate materials. Both Carpenter and Yerkes report that it was a fairly common behavioral pattern in their subjects.

The observations on handedness in the Bronx gorillas are not comparable to other studies since this item was not listed by Carpenter. Oka was observed to make differential use of her hands on 313 occasions and Makoko 184 times. In both animals, the right hand was more frequently employed regardless of the nature of the activity. The frequency of use of this hand was 54% as compared with the report by Yerkes (6) who found that Congo used her right hand some 66% of the time. In Congo's case the left foot was preferred to the hand, whereas in our gorillas there was relatively little pedal manipulation.

B. Eating, Drinking and Elimination.

In the presence of an abundance of food, Oka and Makoko both showed a form of behavior somewhat akin to the hoarding of rats and lower mammals. The gorillas would sweep the food into a heap with either the hands or feet. The heaped food was then examined, tossed around or eaten. This behavior is not mentioned in any other report on the gorilla and may well be the unique result of the absence of manipulatible material in the cages in the Bronx Zoo. Placing of the longer-stalked fruits and vegetables on the heads of the gorillas was a frequent aftermath of the in-gathering of the material.

An interesting aspect of the behavior of the isolated animals was a relatively infrequent passage of food from Oka to Makoko through the bars of the intercommunicating grill between the two cages. The initiation of this activity usually came from Oka and was noted particularly on the several occasions when Makoko had been deprived of his usual rations because of diarrhea or other health considerations. In such circumstances, Oka was observed forcing potatoes and cabbage through the double grill. Makoko did not seem to be particularly interested in the inserted foods. This behavior was seen on three occasions.

The drinking of water is a form of behavior common both to our animals and to those studied by Carpenter. According to Yerkes, Congo drank but little water. The manner of drinking in the Bronx animals was to bend over the fountain and suck the water into the mouth. Although there was no opportunity to study comparative satisfaction from milk and water, it is the opinion of the authors that the milk-egg liquid was preferred.

Regurgitation of the milk-egg mixture was almost invariable. Following the feeding the animals would typically squat on their haunches, lean forward, and regurgitate some if not all of the milk. The gorillas then would examine the liquid manually and eventually bend all the way and lick up the regurgitated material. The time interval after ingestion varied somewhat but was in the neighborhood of 45 seconds. Some chemical changes took place during the brief digestive stay for the milk was usually curdled. This pattern is seen not only in the gorillas at the Bronx Zoo but also in the chimpanzees. Whether or not this is a primate characteristic and analagous to the similar behavior of the pre-socialized human infant or whether it is unique to the subjects in captivity remains a matter for further research.

Voided fecal material was commonly handled both by Oka and Makoko and frequently was used to throw at the keepers, the observers or the public. Handling was casual and seemingly tactually motivated, for the feces were not examined nor used except for throwing. Since the keepers made heroic efforts to keep the cages clean, the opportunities for greater concentration on feces were limited. Carpenter makes no mention of this type of behavior. Urination was a casual affair and no localization of territory for this or for defecation was noted.

C. Self-oriented Activity.

Self-manipulation of parts of the body was a common form of activity in both Oka and Makoko. The parts of the body selected for handling or fingering were not consistent, with the exception of the lack of attention to or focus on the external genitalia. The major phase of activity during which handling was observed was while the gorillas were lying on their backs or stomachs, when parts of the body such as the lips, ears, eyebrows and nose would be held. The absence of genital manipulation may well be the result of the small size of the external genitalia of the gorilla, as described by Carpenter and Goss.

Manipulation of objects in the environment is a frequent finding wherever gorillas have been studied. Carpenter and Yerkes mention this behavior pattern and it was noticeable in the animals at the Bronx Zoo. The female, Oka, showed some tendency to manipulate and examine with greater frequency than her cage mate. In the absence of a variety of objects to examine, the frequency of occurrence of this activity is all the more remarkable.

The attitude of the gorillas toward the water fountain has already been described. An observable difference was noted in the behavior toward drinking water and that emanating from the pressure hoses used in cage cleaning. As indicated above, in the discussion of daily routine, water was used to separate the gorillas and to urge them toward the shift cages. The initial reaction to the stream from the hoses was retreat and excitement. However, once wet, the animals would face into the water and jump up and down. The keepers reported that the animals would on occasion approach more closely to the nozzle of the hose when thoroughly wet. No shaking of the body after the bath was seen during the periods of observation.

Self-grooming does not seem to be a dominant activity in the lives of either the San Diego or New York gorillas. To what extent the absence of this form of self-manipulation is a function of the cleanliness of the environment and the animal is not established by our observations but, as will be noted later, grooming as a pattern of behavior is markedly less present in the gorillas under study than in other primates at the Zoo.

D. Inter-individual Behavior.

The data in this section were obtained during those periods when the animals were together in the same cage. To the extent that the opportunity for such interaction was limited, the enhancement of activity during the periods of joint occupancy of the cage may be a function of the limitation of time during which the two animals could interact.

Both in Carpenter's study and in ours, the major forms of inter-individual activity were running, chasing and wrestling. These behavior patterns were well marked and almost stereotypical in appearance. Chasing was especially vigorous when the cage floor was wet and the gorillas spent much time sliding in a pronograde posture from one end of the cage to the other. Initiation of this activity was fairly evenly divided between Oka and Makoko. Wrestling, too, was not started consistently by either male or female. A dominance pattern was not apparent.

The sequence of individual motor acts in

TABLE II.

Comparative Behavior of Oka, Makoko and San Diego Gorillas.*

Behavioral Classification	Frequency of Occurrence in San Diego	Oka	Makoko
A. *Posture and Locomotion*			
Walking, pronograde	+ + +	+ + +	+ + +
Walking, upright	+	+	+ +
Running, pronograde	+ + +	+ + +	+ + +
Running, upright	ND	+	+
Standing, pronograde	+ + +	+ + +	+ + +
Standing, upright	+	+	+
Sitting	+ + +	+ + +	+ + +
Climbing	+ +	+	+
Swinging by hands	+ +	+	+
Hanging	+	+	+
Sliding	+ + +	+ +	+ +
Left-handedness	ND	46%	46%
Right-handedness	ND	54%	54%
Lying down	+ + +	+ + +	+ + +
Sleeping	+ +	+	+
Nest Building	+	NP	NP
B. *Eating, Drinking and Elimination*			
Gathering food in heaps	ND	+ +	+
Sharing food with cage mate	O	+	+
Drinking water	+ + +	+ +	+ + +
Drinking milk	+ + +	+ +	+ +
Regurgitation of milk	ND	+ +	+ +
Handling of feces	ND	+	+
Attention to urination	ND	+	+
C. *Self-oriented activity (Play?)*			
Self-manipulation (non-genital)	+ +	+ +	+ +
Manipulation of genitalia	O	O	O
Manipulation of objects	+ + +	+ +	+
Manipulation of food (non-eating)	ND	+ +	+ +
Attitude toward stream of water	positive ++	+	+
Self-grooming	+ +	+	+
D. *Inter-individual behavior*			
Chasing	+ + +	+ + +	+ + +
Wrestling	+ + +	+ + +	+ + +
Grooming	+ +	+	+
Inspection and manipulation of genitalia	O	O	+
Presenting	O	O	O
Mounting	O	O	O
Pelvic thrusts	O	O	+
Chest thumping	+ +	+	+ +
Vocalizing	+ +	ND	ND
Dominance	+	+	+
E. *Observer-oriented behavior*			
Throwing of feces	ND	+	+ +
Throwing of non-fecal material	ND	+	+
Attentional responses	positive ++	negative ++	negative ++
Vocalization	+ +	ND	ND

* Key to symbols:

O—Never observed or reported

+—Little in frequency or amount

+ +—Some or fairly frequent

+ + +—Great deal, very frequent

ND—No data reported

NP—Not possible in the environment

the wrestling behavior was free of patterning and seemed to consist of random grappling at the anatomical point nearest to the initiator of the behavior. When the actions of either animal seemed to approach the point at which roughness would ensue, the animal at the moment on the receiving end would detach itself and a period of resting would follow. Of all the behavior noted in this study, wrestling was the most dramatic and illustrative of the great strength of the gorillas. As a rule, there were few vocalizations during the bouts.

Social grooming, certainly, does not seem to be as predominant in the behavior of the gorillas as in the case of other representatives of the great apes or other primates. Carpenter likewise observed little of this sup-

posedly socially oriented activity. It is possible that in the four animals for which data are available, the age and sex differences were not sufficiently well established to facilitate the appearance of this type of social interaction. It may also be possible that there is a real species difference in such behavior.

Genital manipulation and exploration in the paired situation was not frequently observed. It was seen only three times in Oka and Makoko and was not reported for the San Diego pair. In the Bronx specimens, the initiator was always the male. This may be a reflection of the relatively greater maturity of Makoko. So, too, in our gorillas, mounting and pelvic thrusts as precursors of mating behavior were almost completely absent during the periods of observation in New York. Carpenter saw none of this at San Diego, but his animals were both males. The one instance of pelvic thrusts by Makoko occurred during a wrestling bout and was not repeated nor invited by Oka.

Chest-thumping was much more prevalent during the periods of paired activity than when the animals were in their own cages. The causal sequences leading up to the thumping could not be determined for Oka and Makoko although the observers were all of the opinion that the behavior was socially oriented and significant. Some writers have suggested that thumping of the chest is a sign of well-being and general euphoria. Yerkes states that the behavior is a sign of "impatience or other mild dissatisfaction." There was clear evidence of neither causal sequence in our observations. The range of situations during which the thumping was observed varied so widely that no specific factor can be assigned as the reason for its existence. The only statement that can be made from our data is that the male, Makoko, engaged in chest-thumping more frequently than did Oka and accompanied the beating with vocalizations more frequently than his companion.

In the absence of sound-recording devices, description of vocalization is difficult. Furthermore, the public space was somewhat soundshielded by the glass partition separating the animals from the observers. In our experience the occurrence of this activity was less than that mentioned by Carpenter.

E. Observer-oriented Behavior.

The types of audience-attentive behavior observed in the Bronx Zoo consisted mainly of the throwing of feces or food at the glass plate between the cage and the visitors. The same aggressive behavior was noted during an attempt to get photographs of the animals. Visitors invariably tried to attract attention from the gorillas by tapping on the glass partition and by yelling. The effect of such devices was negligible. This difference between our data and Carpenter's may well be the result of the more restrictive conditions of the gorillas' environment in the New York Zoo.

VII. Summary.

This report describes the behavior of two pre-adolescent lowland gorillas in the New York Zoological Park during the summer of 1948. Oka, then an eight-year-old female, and Makoko, a ten-year-old male, were observed in their regular living cages when alone and when placed together.

A check-list was prepared and regular half-hour periods of observation were systematically made. Significant behavioral items were compared for the sessions when the animals were alone and when they were together. Comparisons were also made with the data collected by Carpenter from two male mountain gorillas in the San Diego Zoo.

The descriptive material obtained during the period of observation should serve as a base line from which to note variations arising from the maturation of the two gorillas in the years to come.

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EXPLANATION OF THE PLATES.

PLATE I.

FIG. 1. Makoko, the male lowland gorilla in the New York Zoological Park. Estimated age, 11 years; weight, 408 pounds.

PLATE II.

FIG. 2. Oka, the female lowland gorilla in the New York Zoological Park, is still friendly and gentle with her keeper at the estimated age of 9 years. Her weight is 282 pounds.

FIG. 3. Oka playing with her keeper.